Primary Activities Booklet

Create your own board game

Challenge

Today you will create a board game. This challenge requires you to be as inventive as you like. Before you try this challenge, it may be an idea to get out any board games you have and think about what makes them fun. If you don't have any board games at home, the below link shows different types of board games!

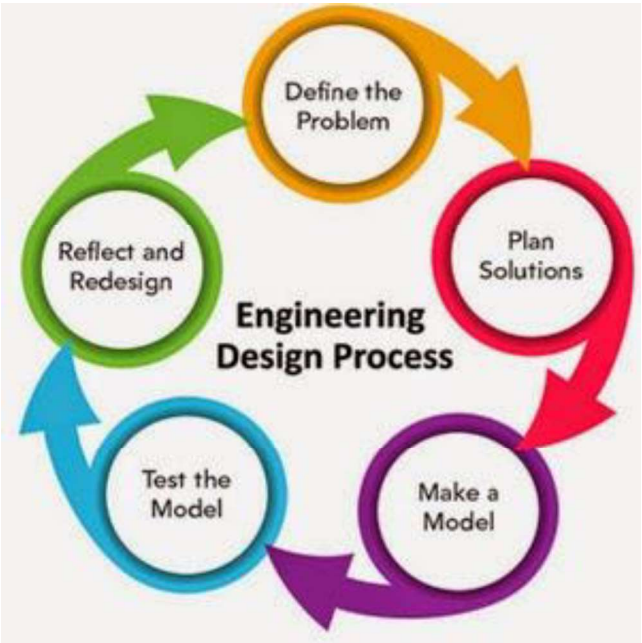
https://en.wikipedia.org/wiki/List_of_board_games

Resources needed

- Paper
- Crayons/ pencil
- Cardboard
- Home materials for moving pieces (e.g. Paper clips, buttons)

Background

To create your board game, you will be using the Engineering Design Process. Below in the diagram you can see the various steps that it takes an engineer when forming a prototype. Remember that engineers use many skills to create or improve a product. The first step is to define what the problem is. After this Engineers work on a series of steps to create the final product. These steps take much trial and error. Try to use this process to design your board game.



Creating your board game

Define the Problem

Firstly, it may be an idea to brainstorm what type of boardgame it is you would like to make. Is it similar to one you have played in the past? Or are you trying to create one that you have never seen before? Once you have that chosen it may be a good idea to pick the theme. For example, will the boardgame be based on your favourite hobbies or superhero etc.

Plan the solution

Next is to think about the various parts of the board game. How many players do you want to include in the game? What length of time do you want the board game to be? How will the players win the game? What are the rules of the game?

Make a model

Using whatever resources, you have at home make a prototype of your board game. This will include the board itself, the moving pieces and any cards that you want to include.

Test the model

With your ready prototype, test how the boardgame plays first with yourself and then try to include some family members.

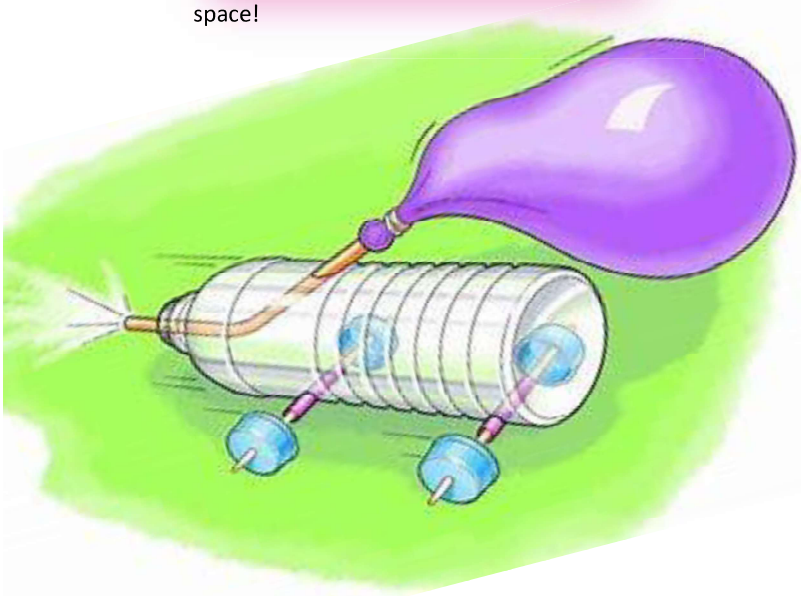
Reflect and redesign

Once you've tested it out with your family you will gain a better idea on anything that needs to change. Think of what went smoothly in the game and reflect on anything that maybe needed tweaking. Add these into your redesign for the final product.

Balloon powered car

Challenge

Today you will construct a car made of bottles, caps and balloons! You will be using one of Newton's well-known laws of motion to make the car move. Can you finish Newton's Law: For every action there is an equal _____? This is how Rockets from NASA are launched into space!



Method

1. Cut one of the straws in half and stick these to one side of the water bottle.

2. Cut a wooden skewer in half. Place each of the skewers through the straws.

3. Place a hole in each of the bottle caps, so they will fit snuggly on the skewers.

4. Place the car on a flat surface and make sure that the car is easy to roll. If not adjust your straw and skewers.

5. Place the balloon securely on the straw using an elastic band/hair tie.

6. On the other side of the bottle, place a hole that is big enough for a straw to fit through.

7. Blow through the straw to inflate the balloon and test how far your car can travel.

Resources needed

- Plastic Bottle
- Two straws
- Four plastic bottle caps
- Wooden Skewer
- Balloon
- Masking tape
- Elastic Band/hair tie
- Scissor

Safety: Makes sure to be careful when using scissors. Always have an adult present.

Results

What happens the car if you inflate the balloon just a little?

What happens the car if you inflate the balloon a lot?

What went well in your challenge, and what improvements could you make the next time?

Bottle Biology

Challenge

In this challenge you will be using bottles to learn about water, soil, plants and the environment. You will investigate the interaction between a terrestrial system (land) and aquatic system (water) by creating a TerrAqua column. Water and land systems are delicately interlinked. By varying water, soil and plants in this experiment you will be able to explore the vital role of each. A further experiment will include using fertiliser to see how it influences plant growth.

Resources needed

- Plastic Bottle x 1
- Scissors
- String
- Bottle Cap
- Water, plants and soil
- Fertiliser

Safety: Makes sure to be careful when using scissors and always have a grown up present.

Method

1. With an adult present, use a scissors to cut the bottle in half (see diagram)

2. Use the scissors carefully to pierce the bottle cap, making a hole small enough for the string to fit through.

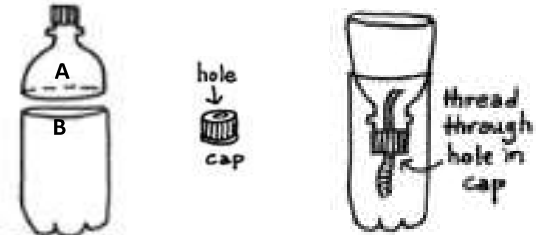
3. Place a string through the bottle cap. The string should be long enough to go from A into B (see diagram)

4. In (A) place soil from the garden into the cut bottle half.

5. Once the soil is placed in (A), add some plants or seeds that were collected from your garden or a nearby park.

6. In (B) place water. This water can be either from the house tap or an outside pond.

7.Once complete make sure to place the bottle near a window so it gets plenty of light.



http://bottlebiology.org/investigations/terraqua_build_1.html

https://twitter.com/teach_la/status/836975014033440770

Investigations

Once you observe how the TerrAqua works, you can now begin to change some variables and see how they impact the land and water system. One such investigation is to add some fertiliser to the soil. You will be able to explore how fertiliser affects the growth of seeds/plants you have in the soil.

To do this you need set up another two TerrAqua columns. Make both columns exactly as before except this time you add a small amount of fertiliser to the soil of **one** of the TerrAqua columns. Over a set number of days, you can investigate the difference between the two TerrAqua columns (How well did the plants grow, count the number of leaves).

From your results, what may be the benefits of using fertilisers?

Extension

Plants play a vital role in our world. They give us the air that we breathe, and many of the medicines that we use. Research how plants have benefited our society. Pick some ways that interests you and make a poster to share your findings.

Liquid Densities

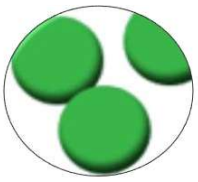
Background

Imagine you have a tennis ball in front of you. You also have a metal ball the exact same size right beside it. Which one do you predict will be heavier?

We would probably predict that the metal ball will indeed be heavier. This is due to the density. Although both balls have the same volume, one seems heavier than the other. The metal ball contains a lot more particles of matter that are tightly packed together, compared to the tennis ball that is mainly filled with air which contains fewer more widely spaced particles. The density of the metal ball is therefore higher than the tennis ball.

Resources needed

- Vegetable oil
- Washing up Liquid
- Syrup
- Honey
- Whole Milk
- Water
- Food Colouring
- Blue berries
- Marshmallows
- Lego
- Large glass

Rubber Ball 

Metal Ball 

Method

Make sure that an adult is present while carrying out this experiment. Please also note that this experiment is not meant to be consumable.

1. Into small cups pour out the same volume of all the liquids. (Note you're experimenting with density, so you want to keep the volume the same)
2. Into the cup with water add some food colouring to it, and to any other liquid that you think needs brightening up!
3. Try to arrange the liquids in order of density.
4. Once you have them ordered start with the highest density liquids. For liquids like syrup, honey and washing- up liquid you can individually pour slowly to the centre of the glass.
5. When adding the whole milk, you can try to add drop by drop to the centre.
6. Finally, when adding the water, you can add drop for drop, and it works best if you add it to the side of the glass rather than the centre
7. Once all the liquids are added now it's time to add the solid objects. Add the objects of your choice slowly and note where they settle in the liquid column.

What was the least and most dense liquid?

What was the least and most dense object?

Why do liquids have different densities?